

THE PHOTOGRAPHIC TEACHER;

WHAT TO DO IN PHOTOGRAPHY,

AND
HOW TO DO IT.

**A CLEAR AND CONCISE COMPENDIUM OF THE
COLLODION PROCESS,**

**TO ENABLE THE AMATEUR AND ARTIST TO BEGIN AND COMPLETE
POSITIVES ON GLASS, CLOTH, ENAMELLED PLATE, &c; ALSO,
TO PRODUCE NEGATIVES ON GLASS, AND PRINT POSI-
TIVES THEREFROM;**

WITH

INSTRUCTIONS IN COLOURING;

ALSO, DIRECTIONS FOR THE

DRY COLLODION PROCESS,

FOR TAKING

THE ALABASTRINE PHOTOGRAPHS,

**WITH A CHAPTER ON THE PRINCIPAL CAUSES OF FAILURE, AND AN
APPENDIX.**

BY

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PREFACE.

THE question has frequently been put to the Writer of the following pages, "Which is the best work on Photography for beginners?" To give a satisfactory answer, it has been necessary to enumerate several; many of the best books, treating of special processes only, and most recent works, evidently supposing the reader to possess a prior knowledge of Photography. The primary object of the present Work is to furnish the entire novice with a practical guide to the practice of Photography on glass and paper, from the first step to the finishing of the picture. It has been the aim of the Writer throughout to treat the subject with sufficient simplicity and comprehensiveness to enable the reader, without any previous knowledge of Photography, to understand and practise the processes explained.

To the practical Photographer it is hoped this will prove a valuable hand-book. The *Dry Collodion Process*, for the formula of which the Writer here begs to offer his acknowledgments to Dr. HILL NORRIS, is, we believe, incomparably

the best that has been made public. The chapter on *Dry Colouring* is more comprehensive than any the Writer has seen. The *Alabastrine Process*, by which some of the finest effects in Photography may be produced, is here for the first time published; and the processes which are not new are here given in such a form as experience has proved to yield the best practical results.

G. W. S.

33, HIGH STREET, ISLINGTON,
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INTRODUCTION.

In the following pages two objects have been kept in view—simplicity and completeness. All ambiguous and unnecessarily technical phraseology is avoided, as are also prolix descriptions of different methods of producing the same or similar results; whilst, at the same time, nothing is omitted in the processes described, which the Writer has found in the course of several years' professional experience, essential to the production of good pictures.

By the term **PHOTOGRAPHY**, is understood all the different modes of obtaining pictures by the agency of light. The process to which, however, we intend first to direct attention, is that discovered by Mr. Scott Archer in 1851, known as the **COLLODION PROCESS**.

Collodion is a solution of gun cotton in a mixture of ether and alcohol, of a thin, glutinous consistency, perfectly limpid, and giving, when poured on a plate of glass, an even and transparent film. To render this available for Photographic purposes, it requires to be charged with some salt of silver, to render it sensitive to the chemical action of light. To effect this, a preparation of iodine is mixed with the collodion, and the plate containing the iodized film, immersed in a bath consisting of a solution of nitrate of silver and distilled water. The affinity existing between iodine and silver causes the plate so prepared to take up a certain portion of the metal, forming on the film a surface of iodide of silver, a salt of silver very readily acted on by light. This plate being placed so as to receive the luminous image of the Camera Obscura,

and subsequently subjected to the action of an agent having the tendency to reduce the salt of silver to its metallic form, an exact transcript of the image in the camera is obtained. Of the details of the manipulation we shall speak in the proper place.

The apparatus required is, comparatively speaking, simple and inexpensive. As, however, both the apparatus and the chemicals can be purchased much cheaper and better than they can be prepared by the amateur, no attempt is here made to explain their manufacture or preparation.

Before entering on any description of the various requisites of the process, we would call especial attention to one preliminary remark, which we wish the reader to remember as applying, in a pre-eminent degree, to every article used in Photography; it is this, that *low prices do not necessarily constitute cheapness.*

One fertile source of failure is the use of imperfect apparatus and impure chemicals, which involve the novice in inextricable perplexities, as well as in greater expense, from repeated waste, than would have sufficed, in the commencement to have purchased perfect articles. The inefficiency of much of the apparatus in use, combined with the inexcusable incompetency of many who undertake the position of professional operators, is evidenced by the thousand and one vile caricatures of the human face and form, which are so frequently exhibited as Photographic Portraits, the single and solitary merit of which would seem that they generally rapidly fade and disappear, as if ashamed of their own ugliness!

COLLODION POSITIVES ON GLASS.

We shall now proceed to describe the apparatus required for the production of positives. The first article required is

THE CAMERA.*

This consists of a double box of walnut-wood or mahogany; the inner box sliding within the outer one, fitting quite closely, so as to be impervious to light. At one end of the sliding-box is a groove to receive the focussing-glass, and the dark frame containing the sensitive plate. The opposite end of the outer box is pierced to receive

THE LENS.

The choice of a good lens is of the utmost importance, for unless a perfect one be used, a good picture cannot possibly be obtained, however complete all the other appliances may be.

There are two kinds of lenses used for Photographic purposes: the SINGLE ACHROMATIC LENS, and the double or COMPOUND ACHROMATIC LENS. The single achromatic is chiefly used for views and still life, because whilst its action is not so quick as that of the compound achromatic, it possesses a much longer range of focus, that is, objects at much greater distances from each other are rendered by it more clear and well defined, or *sharp*, as it is technically called, than would be the case with the compound achromatic; and, moreover, a plate of larger size is covered with a single achromatic lens, than would be with a compound achromatic of the same diameter.

For portraiture, or taking any object that is liable to move, the compound achromatic lens* is used. It consists of a combination of lenses, by which great rapidity of action is obtained, thus obviating the necessity of a long sitting, even in a dull light, and thus lessening the danger of movement on the part of the sitter. In choosing a lens it is

* A catalogue, detailing the varieties and prices of every kind of apparatus, chemicals, and other articles required in the practice of Photography, will be found at the end of this work. "

important to ascertain, first, that it is properly corrected for spherical aberration, so as to give a flat field ; that is, that the image is equally sharp and free from distortion at the edges as in the centre. A lens, the spherical aberration of which has not been carefully corrected, will give an image which, when sharp in the centre, is indistinct at the edges ; see also that the upright lines are not curved instead of straight. It is next important to ascertain that the optical and chemical foci are coincident. If this be not the case, the image, which appears sharp to the eye on the ground-glass, will be out of focus and indistinct in the picture. Ascertain also that the different lenses of the combination are free from *striæ* and curved lines, as distortion will be the inevitable result of such. A small scratch or air-bubble is not of much consequence, as it will produce no observable result on the picture.

For the purpose of giving greater range of focus to all kinds of lenses, a diaphragm or stop with central aperture may be used. If not supplied with the lens, a piece of card, blackened with Indian ink and a small hole punched in the centre, will do. This is placed in front of the lens ; the amount of light admitted will be thus diminished, and the time of exposure consequently increased, but an image much sharper, clearer, and with more objects in focus will be obtained. In a double achromatic lens a good effect frequently is produced by placing a stop midway between the front and back lens of the combination.

The lens is provided with a rack and pinion for adjusting the focus. An approximation to a correct focus must first be obtained, by sliding in or out the inner box of the camera. If it be intended to produce a very reduced copy of the object, then the camera is moved some distance from it, and the inner box pushed closely into the outer one, so as to bring the focussing-glass and the lens closer to each other. If, on the contrary, it is intended that the proportions of the image shall

be large, the camera is placed near the object, and the camera extended by drawing out the sliding body. In order to produce the picture properly in the centre of the plate, it is desirable to mark on the focussing glass, with lead pencil, the size and position of each plate the camera is intended to take, and also to draw diagonal lines from each corner, so that the point where they intersect each other indicates exactly the centre of the plate. Especial care must be taken that the sensitive plate, when in the dark side, occupies precisely the same position in the camera, as the focussing-glass, which should always be placed in the camera with the ground side next the lens. If the sensitive plate, in the dark side, be in the slightest degree nearer to, or further from, the lens, than was the ground-glass, when the object was focussed, a sharp picture cannot possibly be obtained.

THE CAMERA STAND.

This is used for supporting the camera at the proper height and in the proper position. If it be intended to take views, the tripod stand is most convenient from its portableness. For portraiture nothing can exceed the heavy stand with rack adjustment, its weight and firmness preventing vibration.

THE DIPPING BATH.

This is an upright flat jar, made to contain the nitrate of silver solution. It may be made of glass, porcelain, or gutta percha. Perhaps the latter possesses the greatest advantages, in being impervious to light, and not being liable to be broken. A dipper is required, consisting of a strip of plate-glass, about an inch or an inch and a half broad, with a shoulder of the same material cemented on the end, forming a ledge on which the sensitive plate rests while in the bath. In addition to the support furnished by the ledge, the capillary attraction brought into play by the moisture between the two surfaces of glass, thus placed in contact, preserves the plate firmly on

the dipper. The dippers made of gutta percha or glass, with the edge merely bent up, are to be avoided, as they afford a lodgment for a portion of the solution when lifted out of the bath, which is apt to stain the plate.

THE HEAD REST.

This can be had to attach to the back of the chair, or to stand behind the sitter. Its object is to steady the head during the time of sitting, as without such an aid, the mere act of breathing would cause a certain heaving oscillation of the head, which would effectually preclude the obtaining of a perfectly sharp picture. Care must be taken, in using it, not to place it so as to constrain the sitter, nor to appear in sight in the picture. A universal jointed one answers the best.

THE BACKGROUND.

For this purpose a framework of wood, about seven feet square, is covered with some kind of cloth. A woollen fabric, of the proper colour, gives the most pleasing effect, but as it is difficult to procure this of the proper width without joining, and thus showing a line, common unbleached sheeting calico will do. This must be carefully stretched on the frame with tacks, and then coloured in distemper, or with common colours mixed with size, to the right tint. It is of some importance to obtain a suitable colour, for, if it be too light, all white or light coloured objects in the picture will appear to blend with, and be lost in, the background; and if it be too dark, the same effect will be produced as regards the darker portions of the picture. Some shade of grey will answer the purpose best, giving a middle tint which is sufficiently dark to throw up the face, neck, &c., and sufficiently light to contrast with the blacks of the dress, hair, &c. It is desirable, if convenient, to have two sides of the frame covered; one with a colour such as we have just described, and the other somewhat darker, for use where very light dresses are worn.

Three or four porcelain or gutta percha dishes; a couple

of glass graduated measures; a glass funnel, and three of gutta percha; a filter, and waste-tub for water; and a few stoppered bottles of different sizes, will complete the apparatus for taking direct positives. We may here remark, once for all, that bottles, dishes, and funnels *should be kept strictly each to its own use.* It is never wise to use vessels for one solution which have been kept for another, as even an infinitesimally small portion of one chemical, mixed by accident with another, may at times produce disastrous results.

CHOICE AND PREPARATION OF THE GLASS.

This is the first step towards taking a picture. The glasses used are cut to specific sizes to suit the frames of the Camera; and as all cases, passepartous and other fittings for the pictures, are made to these sizes, we may as well here enumerate and explain them. The largest usual size (larger sizes are made, but are specified as extra sizes) is what is termed the whole plate, or $8\frac{1}{2}$ inches by $6\frac{1}{2}$ inches; the half-plate, or $6\frac{1}{2}$ inches by $4\frac{3}{4}$ inches; the one-third-plate, or 5 inches by 4 inches; the quarter-plate, or $4\frac{1}{4}$ inches by $3\frac{1}{4}$ inches; the one-sixth-plate, or $3\frac{1}{4}$ inches by $2\frac{3}{4}$ inches; and the one-ninth-plate, or $2\frac{1}{2}$ inches by 2 inches. The glass known in commerce as "patent plate" is best, or the "flatted crown" may be used if good, and picked free from blemishes. Plates having blisters, scratches, or a rough spotty surface should be rejected. It is better to have the edges slightly roughed, the collodion film then adhering with greater tenacity, thus lessening the danger of—what with some samples of collodion will occur—the separation of the film from the glass in washing.

For cleaning the glasses it is necessary to have a few clean linen cloths, and a mixture, about the consistency of cream, of cyanide of potassium, about 15 or 20 grains to the ounce of water, with whiting or tripoli. The cloths—fine diaper is the best—must be carefully cleansed from all impurities by

boiling in water with common soda, and then rinsing several times in clean water. They must be carefully kept for their purpose, and not used to wipe anything else. The plate must now be rubbed well on each side, with a piece of woollen cloth applied to the whiting mixture ; this done, it is placed in a dish of clean water, and so on with the next until a dozen or two are so treated. They are then taken from the dish and well rinsed under a tap of clean water, then dried on one of the linen cloths, and polished on another, care being taken not to let the hands come in contact with the surface of the glass. Each plate, as it is finished, is put away into a box to be ready for use. Plates that have been used, if the film be removed at once, before it is dry, are easily cleaned ; but if the collodion is suffered to dry, it is very difficult to get the plate sufficiently clean for use again.

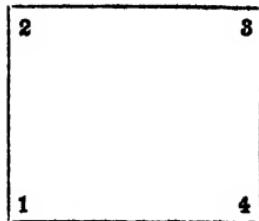
We may here remark that simple as the process may appear, very much of the beauty of the picture depends on the care with which the cleaning is effected, as without a perfectly clean glass—we mean chemically clean—it is impossible to get a picture free from stains. Too much pains cannot be taken in this respect. To ascertain if the plate be quite clean, breathe upon the surface, and if the moisture disappear gradually and evenly, it is clean ; if, on the other hand, it dry in irregular streaks, or show spots, it must be cleaned again.

COATING THE PLATE.

Take a cleaned plate from the box, and with a soft piece of wash-leather, which has been cleansed from grease by washing in alcohol and water, give a finishing polish ; breathing on the glass, as before described, to ascertain if it be perfectly clean ; then with an India-rubber blower, or large camel's-hair dusting brush, remove any particles of dust. It is now ready to receive the film of collodion.

Collodions vary materially in their characteristics, as well as in price, but here, especially, our preliminary remark on

cheapness must be remembered. A bad collodion is worthless at any price. A collodion which flows evenly over the plate, not so thick as to give an irregular coating, nor yet too limpid, and presenting a tolerably dense, creamy film, on removing from the exciting bath, has, in our hands, yielded the most satisfactory results.* Having once obtained a good collodion, it is wise to adhere to its use, as much more certainty in working may then be obtained. It is desirable to keep a stock in a large bottle, and, from time to time, pour from it carefully, so as not to disturb the sediment or "bottoms," into a smaller bottle for use. By this means the film will be free from the spots, which would otherwise arise from disturbing the settled particles. Care must be taken in this respect, as also to have the neck of the small bottle free from pieces of dry collodion, which, if dropped on the plate with the collodion, would spoil the film. The plate perfectly clean and free from dust is now held between the finger and thumb of the left hand, by the corner marked 1, in the following diagram :—



From the small bottle sufficient collodion to cover the plate is poured gently in the centre; the plate is now, by a gentle turn of the wrist, inclined so that the fluid runs to the corner marked 2, then to the corner marked 1—taking care to avoid touching the thumb—next to the corner marked 3, and then to that marked 4, from which it is drained off into the bottle. The plate is then brought into a vertical position, so that the

* A collodion possessing these characteristics is manufactured and sold by Messrs. HENRY SQUIRE & Co.

diagonal lines, which have formed by draining off at the corner, run into each other, and leave the film perfectly smooth and even. The tilting of the plate to each corner must not be done abruptly, or the collodion will run off the plate; the movements towards each corner must glide easily into the other. A little practice will be required to effect this perfectly. Hurry must be avoided; celerity will come with practice. As the ether is very volatile, the collodion necessarily in the course of use gets thicker from evaporation. It may be kept a proper consistency by the addition, from time to time, of thinner collodion, or a little pure ether. In the course of use, also, particles of dust, &c., get mixed with it; it may occasionally be filtered through a little clean cotton-wool, placed in the neck of a glass funnel. As dust is, however, a fearful antagonist to perfect photographs, it must be excluded, as much as possible, from the operating-room. This must, however, be done at night, as the dust should, on no account, be disturbed while operating.

After coating the plate, a few seconds should elapse before placing it in the nitrate bath. No specific time can be given, however, as it varies with temperature, &c. If carefully watched, the eye will soon become accustomed to ascertain when it is beginning to set; then is the time for immersion. If kept out too long it will be unequally sensitive, the dryest parts being least sensitive. If immersed too soon, the plate will be marked with streaks or fringes from the parts where the collodion is least set.

All the processes up to this point have been conducted in daylight; before proceeding further it is desirable to describe

THE DARK ROOM.

This must be constructed so as to exclude every ray of white light. If a room, from which light can thus be shut, be accessible and convenient, the window can be covered with a double thickness of yellow-glazed calico, by which means

sufficient light (which passing through a yellow medium has no chemical action) for the purposes of manipulation, can be admitted. If no such room be convenient, a closet sufficiently large can be easily constructed by means of a framework of wood, covered with black or yellow calico. If sufficient light cannot be admitted by means of yellow calico, the light of a lamp or candle, screened by yellow glass, can be used. Care must be taken never to unstop a bottle of collodion near a naked flame, the rapid vaporization of ether, and its extremely inflammable nature, rendering it dangerous to do so.

In the dark room is the nitrate of silver bath for exciting the plate, a bottle containing developing solution, a gutta percha dish, over which the plate is held while developing, and into which the surplus runs, a vessel containing clean water, and a dish containing fixing solution, together with funnels, filtering paper, and a cloth to dry the frames.

TO EXCITE THE PLATE.

For this purpose the following solution is required :—

Nitrate of silver	30 grains.
Distilled water	1 ounce.

The pure re-crystallized nitrate of silver must be procured, as the common fused nitrate of silver is often much adulterated. If distilled water cannot be obtained, carefully filtered rain water may be used. Enough of this solution must be made to fill the bath (before described). About half an ounce of silver, making eight ounces of solution, is sufficient for a small bath. When commencing with an entirely new bath, it is necessary to saturate it with iodide of silver. To effect this, from one to two grains of iodide of potassium must be dissolved in a dram of water, and added to the eight ounces of solution. This will produce a yellow turbidity, which will, however, subside. The solution must now be filtered into the,

gutta percha bath, and after standing a few hours is ready for use. When a bath is once in working order, it is wise to keep it replenished from a stock bottle of about 35 or 40 grains of nitrate of silver to the ounce of water. If the chemicals are pure, the exciting bath, thus prepared, should give a good picture; should it, however, appear *foggy*, test the solution with blue litmus paper, if it be not slightly reddened, add a few drops of pure nitric acid, which will probably bring the bath into working order. It should occasionally be filtered, and the gutta percha bath well washed.

The plate coated with collodion, as before described, is placed upon the dipper, and plunged steadily into the bath. If any pause or hesitation be made in doing this, a line across the picture at the point of pause will be the result. After allowing it to remain not less than half a minute, move it in and out of the bath a few times, to suffer the ether to escape. It must then be allowed to remain in from two to three minutes. The time required will vary with the temperature, but observation of the condition of the film will always determine whether it has remained a sufficient time. If it has remained in the bath long enough, it loses the greasy appearance which it had when first moved from the bath, and presents a smooth, even, creamy surface. It is now withdrawn from the bath, and suffered to drain a few moments, with one corner resting on the dipper; it is then wiped at the back, and the superfluous fluid removed from the bottom by means of a piece of bibulous paper, and then placed in the dark frame. It is now ready for exposure in the camera.

Whilst the plate is in the bath, however, the operator has been arranging the position of the sitter. Before speaking of this we will describe

THE OPERATING ROOM.

The best room for the purpose is one with a portion of sky-light and a portion of side-light, both of which should, if

possible, be facing the north, as that light is exempt at all times of the day from the direct solar ray, and is most uniform therefore in chemical action. If the north light cannot be had, the next best will be in the following order:—north-east, north-west, south-east, east, west, south. A great mistake is frequently made by amateurs. They seem to imagine that plenty of light is all that is required to produce a picture; it should be remembered that the arrangement of the light so as to produce the proper shadows, is the important point. For this reason, operating in the open air is undesirable, as the light thus falling on the sitter from all directions, the shadows are indefinite. The light directly from a skylight is also undesirable, because the shadows are then unnaturally heavy under the eyes, nose, and chin, whilst the top of the head is excessively light. If a skylight be used, the sitter should be placed somewhat behind it, or under a darkened portion of it. Where it is practicable, it is best, as we have said, to have a side window joining the skylight, and the sitter a little behind both, with his side to the window; a screen covered with white calico may be placed opposite the window, by moving which nearer to, or further from the sitter, the depth of shadow on the side turned from the light may be regulated.

POSITION OF THE SITTER.

All the most perfect mechanical and chemical results will be completely wasted without attention to this point. An awkward, ungainly position will spoil the finest portrait. Photography, it should be remembered, is, at best, but an adjunct to art, and, without regard to this fact, whilst it may be possible to produce a good photographic image, is useless to hope for a perfect *picture*. In order to attain success in this department, the photographer who aims at artistic excellence should carefully study the productions of the great masters, or well-engraved copies of them. Observe carefully.

the position of their figures, the arrangement of the drapery, and the effect of light and shade. Remember, that whilst in photography, flattery is for the most part impossible, yet it is always desirable to make the best of your subject. It is quite possible to take two portraits of one person, both good photographs, and both unmistakably like the sitter, yet one of which shall be repellent and unpleasing, whilst the other shall be in all respects an agreeable and satisfactory portrait. It is well to acquire a habit of rapidly studying the characteristics of a sitter, so as to form a judgment as to which view of the figure and features is most likely to make a striking and pleasing portrait. To avoid exaggerating peculiarities, or, in fact, if they amount to deformities, try to hide them entirely. We might fill a much larger book than this is, if we entered into detail on this subject, but, with these general remarks, we must leave it to the good taste of the operator.

Having placed the sitter in such a position as to get the figure well illuminated, with well-defined lights and shadows, ascertain that he is in such a position that not only looks easy, but feels easy. The face is best a little quartering from the light (about a three-quarter face will, in nine cases out of ten, give the best results.) The eyes must not be turned towards the light, especially if they are blue, or if dark, and very round and full. They should be fixed on a small object on their own level. Persons who squint, or who have very weak eyes, may have their eyes cast down on a book as if reading. The hands should be placed in an easy, natural position, and to avoid making them appear large, they must not be placed in adyance, nor present their whole breadth to the camera. A skilful artist will contrive by his manner and conversation to induce a happy, cheerful frame of mind in the sitter, and to remove the feeling of restraint and nervousness which many persons feel whilst sitting. The head-rest must be placed so as to support without incommoding or restraining the sitter. If the background be, at least, two feet behind

the sitter, it will give more relief to the figure. Where groups are taken, some skill and judgment must be used in composing a natural and effective picture, and, at the same time, preserve all the figures in focus.

The position of the figure being satisfactorily arranged, proceed to the camera, which should be placed about on a level with the head of the sitter, and slightly tilted so as to bring the whole of the sitting figure in focus. Now throw a piece of dark cloth over the camera and over your own head, and proceed to obtain a perfectly sharp image on the ground glass. To effect this, it is best to focus by the eye of the sitter, moving the lens by means of the rack and pinion, until the point of light on the orb is smallest and most intense; observe then that the other portions of the figure are in focus, and that the image is clear and perfect throughout; that the background is in a position to cover the plate; and that no direct sunlight falls either on the sitter or enters the lens. This done, the dark frame containing the plate is placed in the camera. The next step is the

EXPOSURE OF THE PICTURE.

For the time of exposure no fixed rule can be given, as it will vary with the sensitiveness of the film, the amount of light, the kind of lens, and the strength of the developing solution. The precise time of exposure must be decided by the judgment of the operator. From five seconds to about a minute, varying according to circumstances, may be required; if the time be much less than five seconds, it is difficult to regulate it accurately; and if more than a minute, the draining of the nitrate of silver solution on the plate is apt to produce stains. The plate should be exposed as soon after leaving the bath as possible; all the arrangement of the sitter, focussing, &c., being done before placing the plate in the dark frame. The development, washing, and fixing should also be done without loss of time.

DEVELOPMENT OF THE PICTURE.

Having returned to the dark room, remove the plate from the frame, holding it between the finger and thumb of the left hand, touching the edges only, pour over it sufficient to cover the plate, of the following solution :—

Protosulphate of iron	15 grains.
Glacial acetic acid	15 minimis.
Alcohol	15 minimis.
Filtered water	1 ounce.

Or the following :—

Protosulphate of iron	20 grains.
Glacial acetic acid	15 minimis.
Nitric acid	1 minim.
Alcohol	20 minimis.
Filtered water	1 ounce.

One of these solutions, having been filtered, is to be poured gently on the plate at one corner, and the same time the plate dexterously tilted, so as to cause the solution to flow all over the plate without a pause. Care must be taken in this respect, as any check or irregularity in the flowing of the solution will cause a stain. In some conditions of the collodion and the bath, it is difficult to get the solution to flow evenly, it having a tendency to run in greasy lines ; this must be obviated by the addition of more alcohol to the developing solution. The time required for development can only be learnt by practice, and observing carefully the effects which follow the pouring on of the solution. If the right amount of exposure has been given, the plate, which is held over a gutta percha dish, to catch the superfluous solution, shows at first the high lights of the picture, as the shirt front and collar, the forehead, nose, &c., gradually the less illuminated portions, and finally, by contrast, the shadows are seen.

The plate during development must be kept gently in motion, and care taken not to carry the development too far, as in a glass positive it is not necessary at this stage to see all the details of the picture. If the whole of the picture start out at once immediately on the application of the solution, the plate has been too long exposed in the camera. If it appear very tardily and imperfectly, longer exposure is required.

A developing solution prepared from a formula we have long used, and which gives unerringly beautiful and satisfactory results, is sold by Messrs. Henry Squire and Co., in half-pint bottles at 6d., and in pint bottles at 1s. each. Where any difficulty is found in getting perfect and fine-toned pictures, we recommend the use of this developing solution.

Having carried the development far enough, wash the film with a stream of clean water until it flow evenly over the surface free from greasy lines, and then proceed

TO FIX THE PICTURE.

For this purpose prepare a solution as follows :—

Cyanide of potassium	10 grains.
Water	1 oz.

The washed picture is plunged into a dish containing the solution, and watched. The whole of the iodide of silver in the film, not reduced by the action of light and the developing solution, is by this process removed, and the picture, white and dense in the high lights, gradually diminishing in intensity in the half tones, and quite transparent in the deepest shadows, is now seen. As soon as the yellow iodide is removed, quickly wash the plate in plenty of clean water, as if any of the solution remain it will attack and gradually destroy the picture. After allowing the plate to remain a few minutes in a dish of clean water, thoroughly rinse it and dry by the fire.

If the whole of the processes have been carefully performed,

we have now a plate, which, if backed up with something black to give the shadows, presents a satisfactory positive picture. If it appear flat, with little contrast between the highest lights and the deepest shadows, the exposure in the camera has been continued too long. The same effect, however, may be produced by white light having obtained admission into the dark room or camera, and also in a minor degree by over-development. If the whole picture appear dark, the shadows wanting in detail, it has not had sufficient exposure. If the highest lights appear good, but the picture wanting in detail, the shadows being in heavy masses, it may have been slightly under-exposed or undeveloped. If the result be satisfactory, the plate is washed and dried, as we have described, and we then proceed

TO VARNISH THE PICTURE.

Of the transparent white varnish for applying to the surface of the picture, we will speak in the chapter on Colouring. The picture is now to be backed up with black varnish on the side of the glass opposite to the film. Various black varnishes are prepared for this purpose, the majority of which crack and spoil the effect of the picture. A black varnish, which we have long used, and in no case found it crack, is prepared by Messrs. Henry Squire and Co., and sold in 6d. and 1s. bottles. The varnish is poured on the glass, like collodion, and drained from one corner, care being taken not to allow it to run on the other side containing the picture; it is then dried by the fire.

If the picture be not very intense, the highest lights being somewhat transparent, fine black cotton velvet may be used, instead of the varnish, with advantage, the black varnish giving a grey tone to the whites in such pictures. The black velvet does not impoverish the whites, but is not so rich in blacks as the varnish. If the picture be required non-inverted, the backing may be placed on the collodion side of

the plate ; the picture is then seen through the opposite side of the glass. In this case a colourless glass must be used, as the green tint of the common glass would spoil the tone of the picture. Velvet is better for backing than varnish in such cases.

If the picture is to be uncoloured, it is now carefully placed in the passepartout, or ~~case~~, and sealed up from the atmosphere.

We have now placed before the amateur full instructions for the production of positive pictures on glass. As it will be seen from a glass positive, that the shadows of the picture are obtained by placing something black behind the transparent film, it will be at once apparent that advantage can be taken of the circumstance to produce the picture on black enamelled cloth, leather, enamelled iron plates, &c. ; in fact, any substance presenting a perfect black surface, and which will not injure the bath. The enamelled iron plates sold for the purpose are dangerous to the bath, unless completely covered on both sides and edges with enamel.

Some remarks on failures and their causes will be found in another chapter.

COLLODION NEGATIVES.

A negative is a picture which, when viewed by transmitted light, presents the lights and shadows reversed : that is, it is perfectly dense or opaque, so as to obstruct the light in the whites; and clear and transparent in the blacks. From it any number of positives on paper may be printed by the agency of light.

All, or greater part, of the instructions for taking positives are available for the production of negatives ; we shall, therefore,

fore, only give such additional directions as the difference in manipulation requires.

The glasses for negatives should be of patent plate, and chosen free from all imperfections, as any scratch or blister would show in the paper proof.

The collodion is differently prepared to that for positives, and is best freshly iodized. The iodizing solution and collodion should be had separately, and mixed in small quantities from time to time, as required. A collodion to produce a good negative should not be too thin, and should give a dense, creamy coating in the exciting bath, in which it should remain somewhat longer than is necessary for a positive.

THE BATH

must also be differently prepared, and made a little stronger than for positives. The following proportions will be found suitable:—

Nitrate of silver (pure crystallized)	35 grains.
Alcohol	10 minimis.
Distilled water	1 oz.

This having been saturated with iodide of silver, as described for the positive bath, a picture may be tried. If the resulting negative be not satisfactory, the bath must be tested with blue litmus paper. If it be reddened, it indicates the presence of nitric acid, which is injurious in a negative bath, and a little pure carbonate of soda must be added, until a slightly alkaline reaction is induced; then add pure glacial acetic acid until a slightly acid reaction follow. By this process acetate of silver is formed in the bath, the presence of which is useful, ensuring the absence of free nitric acid in the bath, and adding to the intensity of the negative. If on testing, the litmus paper is not reddened, try a piece which has been reddened by holding it over the vapour of acetic acid, and if this be turned blue by the bath, it indicates alkalinity,

which must be corrected by the addition of acetic acid. In each case it will be well to filter the bath after correcting it. For negative purposes, a bath as nearly neutral as possible is desirable; but as it is then more difficult to get perfectly clean pictures, and free from fogging, it is best to preserve a slightly acid reaction.

The plate having been coated with a good negative collodion, and suffered to remain in the bath a little longer than for a positive, is to be exposed in the camera from half as long again to twice as long as for a positive. No definite rule can be laid down for the time of exposure, as different collodions require different treatment in this respect, some negative collodions requiring even less exposure than would suffice for a positive.

TO DEVELOP NEGATIVES,

a solution should be made as follows :—

Pyrogallic acid	1 grain.
Glacial acetic acid	10 minims.
Alcohol	10 minims.
Distilled water	1 oz.

This solution becomes deteriorated if kept long prepared, and should therefore be made fresh, and not used more than a few days old. With some collodions, or in cold weather, a stronger solution may be found necessary; it should, however, never exceed three grains of pyrogallic acid to the ounce of water, and the proportion of acetic acid should be increased in like ratio.

The exposed plate having been brought into the dark room, a quantity of the solution sufficient to cover the picture having been filtered into a clean glass, is poured carefully and evenly over the plate, which is either held in the hand, or placed on a levelling stand, the same care being taken to cover it quickly and regularly to avoid lines as in

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positives. The plate must be kept in motion, and must be carefully watched; the image will come up somewhat in the same manner as in a positive at first, but with more vigour and boldness, and the development must be carried to a much greater extent. After developing a while, the solution may be thrown off into a clean porcelain dish, and the plate held up to the yellow light. If it has been properly exposed in the camera, and developed sufficiently, the picture will appear clear and distinct, very black and dense in the high lights, quite transparent in the shadows, and the half tones with their proper gradation of semi-transparency. If the high lights do not appear sufficiently dense, a few drops of nitrate of silver solution from the bath is to be added with the dipper to the developing solution in the dish and well mixed; the plate is again to be treated with this mixture, pouring it off and on the plate, until the proper density is attained.

A knowledge of the exact appearance a negative should present during the process of developing can only be acquired by practice. If the plate has been over-exposed, the picture will appear to leap out at once on applying the developing solution; but instead of acquiring density, the image will appear faint and flat, high lights and shadows alike. If, on the contrary, it has been under-exposed, the whole picture will develop tardily; and the high lights, perhaps, attaining great density, but the picture wanting in detail, no distinction appearing between the half-tones and the deepest shadows. When sufficiently developed, the plate must be carefully washed in clean water, and fixed in the following solution:—

Hyposulphite of soda	1 oz.
Water	2 oz.

It is then to be thoroughly rinsed and dried.

A negative that is good in other respects, but wanting in density in the high lights, may be intensified by the applica-

tion of a saturated solution of bi-chloride of mercury, with a few drops of hydrochloric acid added. The picture, having been fixed and washed, is to be treated with this solution, which will have the effect of increasing the density of the highlights, which will also be bleached to a bluish white. It is now to be rinsed and plunged in a dilute solution of ammonia, or of hyposulphite of soda, when the whites will become quite black and opaque.

If the negative be sufficiently dense, it should now be varnished with a white, hard varnish, as a protection from injury during its further use. If it be somewhat faint and slightly transparent in its highest lights, varnishing would reduce it still further. The negative is now ready for the production of positive prints.

THE PRINTING OF POSITIVES.

The term printing in Photography means the production of positives on paper, by the agency of light, from the negative previously obtained.

PREPARATION OF THE PAPER.

This is the first step after obtaining the negative. There are three preparations of sensitive paper which may be used in printing—the plain salted paper, the ammonio-nitrate paper, and the albumenized paper. Paper manufactured for the purpose should in each case be used.

The PLAIN SALTED PAPER is prepared as follows:—

Chloride of ammonia	10 grains.
Distilled water	1 oz.

A sufficient quantity of the solution to fill a clean, flat, porcelain dish, half or three-quarters of an inch deep, must

be made. The paper, cut to the proper size, is marked with a pencil on the corner of the smoothest and hardest side. It is then floated, the marked side downwards, on the solution for three minutes. Care must be taken in placing it on the solution that the whole of the surface comes in contact with the water, and that no air bubbles are formed under. Any quantity of paper can be thus prepared at one time, and preserved ready for exciting. This can be done in daylight.

To render this sensitive a sufficient number of sheets for immediate use must be floated for three or four minutes, prepared side down, on the following solution :—

Nitrate of silver (pure)	60 grains.
Distilled water	1 oz.

This must be done in the dark, or by the aid of yellow light, and the sheets pinned by one corner to a lathe or piece of cord stretched for the purpose, and hung to dry in the dark. Only the quantity required for immediate use must be excited at a time, as it spoils with keeping. When dry it is ready for the printing frame.

THE AMMONIO-NITRATE PAPER is prepared as follows :—

Chloride of ammonium	5 grs.
Citric acid	5 grs.
Bicarbonate of soda	5 grs.
Gelatine	1 gr.
Distilled water	1 oz.

The paper marked as before described, is to be floated in the above solution. It is then rendered sensitive by a solution of ammonio-nitrate of silver, prepared as follows :— Of nitrate of silver take sixty grains to the ounce of distilled water ; dissolve in half the total quantity of water to be used.. Then add, drop by drop, a solution of pure ammonia, stirring meanwhile with a glass rod. This renders the solution turbid, & brown precipitate of oxide of silver being formed ; this, however, is re-dissolved, and the solution clears

up more ammonia is added, care being taken, however, not to add the ammonia in excess. To make this quite certain, it is well when the liquid has become perfectly clear to add a drop or two of nitrate of silver solution until a *slight* turbidity again appear; then add the remainder of the water. The solution should be kept in a dark place.

This preparation should be applied to the paper with a flat brush or a glass rod, and any portion which has touched the paper should not be returned to the bottle. The brush for such purpose should be kept scrupulously clean. The paper should be laid upon a clean board, to be kept for the purpose, rather smaller than the sheet of paper. The solution is brushed lengthwise and crosswise so as to cover evenly with it, which must be suffered to remain on the paper about a minute, and then pinned up by the corner to dry in the dark. If a glass rod be used, which is perhaps best, stretch the paper on the board, pinning the edges over; then lay the rod across the sheet near to the edge, and pour a little of the solution along the side of the rod, which is then to be carried evenly across the sheet, thus spreading the solution evenly as it goes. The ammonio-nitrate paper should be used as soon as prepared, as it rapidly spoils.

The ALBUMENIZED PAPER may be prepared as follows:—

Chloride of ammonium	20 grains.
Distilled water	1 ounce.
Albumen	1 ounce.

For the albumen, the whites of new-laid eggs should be used. The mixture must be whipped or beaten, until it runs clear and limpid. It is to be then left to settle, and when required for use, poured off, without disturbing the sediment, into a clean flat dish. The paper is to be floated for a minute and a half, especial care being taken to exclude air bubbles between the paper and the solution. It is then hung up to dry. Any quantity can be thus treated and kept; but as if

can be purchased ready prepared, and will save the novice much trouble and risk in an important and delicate piece of manipulation, it is better to buy it albumenized, ready for the exciting solution. To render it sensitive, take of .

Nitrate of silver (pure)	60 grains.
Distilled water	1 ounce.

The albumenized paper is floated on this solution* from three to four minutes, varying with the texture of the paper; a stout hard paper requiring a longer time than a thin one. It is then pinned up to dry in the dark, and is then ready for the printing-frame.

PRINTING THE POSITIVE. •

For this purpose a PRESSURE-FRAME is required. It is made for the purpose with a hinged back, to admit of one portion of the print being examined during the process of printing, without disturbing its position on the negative. The back of the frame having been removed, the negative is laid collodion-side uppermost on the glass of the frame; the prepared paper is then laid, sensitive-side downward, on to the negative; the back of the frame is replaced, and screwed down with care, to secure an even pressure, as, without caution in this respect, it is easy to crack the negative. It is then exposed to the brightest available light. The time required for printing will vary with the quality of the negative, the sensitiveness of the paper, and the intensity of the light; a few minutes in a bright sunlight being sufficient, and an hour or two being required in a dull light. The picture can be examined during the progress of printing, by unscrewing one-half of the hinged back of the frame, and lifting up part of the print from the negative. To secure a

* The silver solution becomes discoloured by frequent contact with the albumenized paper, but may be rendered clear again by filtering through animal charcoal or kaolin.

good result in the finished picture, it is necessary to overprint, as in toning and fixing the proof a certain amount of depth is lost. A number of proofs may be thus produced and put away in the dark, until it is convenient to tone and fix them.

TO TONE AND FIX THE PICTURE.

For this purpose a solution is required, as follows:—

Chloride of gold	1 grain.
Nitrate of silver	4 grains.
Hyposulphite of soda	1 ounce.
Distilled water	2 ounces.

The hyposulphite of soda is to be dissolved in half the amount of water, and the chloride of gold and the nitrate of silver, each separately, in portions of the remaining water. When dissolved, the chloride of gold solution is to be added by degrees, stirring the while, to the hyposulphite solution, and afterwards the nitrate of silver solution. The mixture must then be set aside for twenty-four hours, after which, filter through bibulous paper, and it is ready for use. After being in use some time, it will begin to tone more slowly; more chloride of gold must then be added, and at the same time a few crystals of hyposulphite of soda.

The positive a little over-printed, after being taken from the pressure-frame, is to be washed in clean water until it runs clear, free from milkiness or turbidity; it is then placed in the toning-bath, where it immediately assumes a somewhat red colour, and subsequently begins to deepen, and must remain in until it acquires the tint required. If the bath tone slowly, there is danger of the whites becoming somewhat yellow, if the print remain in the bath sufficiently long to produce a deep colour in the shadows. There is also danger of this, if it be exposed to much light in the process of toning.

The print having been toned sufficiently, is to be now washed, so as to free it entirely from all traces of hyposulphite of soda, as the slightest portion remaining will continue to act upon and injure the picture. To effect this, the print, on first removing from the fixing-bath, must be washed in successive waters for about five minutes, then left to soak in fresh water for a quarter of an hour; this must be poured off *entirely*, and the process repeated five or six times. If it can be placed under a continuous stream of water for a few hours, the result will be more certain; finally, wash and rinse in boiling water. This will very likely slightly injure the tone, but the loss will probably be restored by ironing with a hot iron.

Another mode of toning and fixing, somewhat more troublesome in its details, but giving, when properly managed, very fine results, is known as the *sel d'or* toning process. It is as follows:—Take of

Chloride of gold	1 grain.
Hyposulphite of soda	3 grains.
Hydro-chloric acid	4 minims.
Distilled water	4 ounces.

The gold solution is to be mixed separately in half the water, and poured into the hyposulphite solution, not the hyposulphite to the gold, and the acid added. It is best prepared as required.

The prints to be toned thus must not be so much overprinted as for the former bath. On coming from the frame they are to be well washed in several waters, the last water having a little common salt added. They are then placed in the *sel d'or* solution and kept moving, watching carefully for the desired tints. From two minutes to ten, or even more, may be required to produce the rich black tones. On removing from the bath, the prints are to be washed for about a

minute in clean water, and then put to fix in a bath, as follows:—

Hypsulphite of soda	1 ounce.
Water	6 ounces.

The time required for fixing is from ten to twenty minutes, according to the texture of the paper. The print is now to be washed, as before described. This process is not so suitable for the albumenized paper as the former one.

An over-printed picture may be saved from wasting, and a very good result produced, by toning with the chloride of gold solution alone instead of *sel d'or*. It is then to be fixed and washed in the usual way.

It should be remembered that too much care cannot possibly be used in the fixing and washing, as it is upon the success of these processes that permanency of the proof depends. It is, perhaps, impossible to guarantee entire permanency in paper photographs under any circumstances; but without the utmost care in fixing and washing, it is certain that discolouration and fading must be the result.

The next step is

TO MOUNT THE PRINT.

For this purpose a solution of gelatine, freshly made, may be used, or gum-water tolerably thick, made with *hot water*. Paste, or anything liable to turn acid, should not be used, or the photograph will be injured.

The stains on the fingers from nitrate of silver may be removed by rubbing with a piece of cyanide of potassium, and washing. As this is a very deadly poison, care should be used to avoid its coming in contact with cuts or abrasions of the skin. If such stains are suffered to remain for some time, a piece of pumice-stone may be used.

ALABASTRINE PHOTOGRAPHS.

A collodion positive on glass, however perfect, is always inferior in vigour and intensity to a paper print from a negative; whilst the finest paper pictures are, necessarily, from the coarser texture of the surface, somewhat wanting in delicacy. We are now about to describe a process of recent discovery, and now for the first time published, for the production of direct positives on glass, which combine much of the beauty and vigour of the paper proof, with all, or more than all, the delicacy and detail of the ordinary glass positive.

The alabastrine photographs—we have so called them from the appearance of the whites, which much resemble the colour of pure white alabaster—surpass in delicacy, while they equal in intensity, anything that has yet been produced in Photography. When perfectly executed, they have the appearance of proofs on pure white marble or alabaster. The highest lights are exquisitely pure and intense; the deep shadows are a rich velvet-like black; whilst the gradation of half-tone is unequalled.

For producing these pictures the ordinary collodion, exciting, and fixing baths are used, the process up to a certain extent being in all respects as previously given for glass positives. The picture to be operated on must not be too pale; a vigorous good positive, with strongly marked lights and shadows, free from any tendency to fogging, is required for the production of good results. Such a picture having been obtained, after fixing in the bath of cyanide of potassium, is to be thoroughly washed in hot water, in which it may be suffered to soak a while. It must then be rinsed in cold water.

Now place the picture on a levelling stand, or hold in the hand as for developing, and pour gently on to the surface at

one corner sufficient of the "Redeveloping Solution" * to cover the plate, which must now be kept gently in motion and carefully watched, whilst it undergoes a series of changes similar to those of a Daguerreotype in the process of gilding. At first the picture becomes faint and feeble, and in some cases almost disappears; gradually, however, it gains in intensity, and continues for some time growing more and more vigorous. The redeveloping process must be continued until the whites have attained their utmost purity; the blacks will, at the same time, have become deeper, and the half-tones more delicate and better defined. The time required for producing this result will be found to vary; sometimes a few minutes will suffice; at other times half an hour will not be found too long.† It is better to redevelope too long than discontinue too soon, for whilst excess of redevelopment may slightly destroy the diaphanous effect of the whites in which they so beautifully resemble alabaster, and give them a slightly chalky effect, yet, if the redevelopment be discontinued too soon, we have found a tendency in some pictures rapidly to tarnish and discolour. This discolouration is, however, easily removed, by a fresh application of the redeveloping solution.

The desired effect having been attained, the solution is to be thrown off, and the picture again thoroughly washed; hot water or cold may be used; if the latter, longer washing will

* Sold by Henry Squire and Co., in bottles, at 1s., 2s., and 3s. 6d.

† This appears to be influenced by the temperature, the kind of collodion used, and the class of picture obtained. Heat facilitates the process. An anhydrous collodion seems to require a long time to produce the desired effect; and a very dark picture requires longer treatment than one which has been exposed in the camera just the right time. We have, however, produced very fine results by subjecting a very dark picture to a bath of the redeveloping solution for *some hours*. A collodion prepared to produce the best results, is sold by Henry Squire and Co.

be necessary. It is now to be dried by the fire, and is then ready for varnishing.

The varnish* prepared for these pictures may be applied with or without heat, but in the latter case the blacks are not quite so rich. The plate should be *gently* heated, and the varnish poured on the picture like collodion, and drained off at one corner; it is then dried before the fire, a few minutes being sufficient. These pictures are better backed with fine black cotton velvet than with black varnish. A still better backing, perhaps, is fine cotton velvet, of a very deep maroon or violet tint, which gives a peculiarly warm and pleasing tone to the shadows.

In colouring these pictures great care is required, and with skill the very finest effects may be produced, as the dry colours adhere to the surface like crayons.

The same care to protect the alabastrine photographs from the atmospheric air should be used as for Daguerreotypes. They should, when put up with the mat and glass, be sealed with gummed paper before putting on the preserver.

STEREOSCOPIC PICTURES.

The effect of the stereoscope in combining two pictures taken at the requisite angles, so as to give the appearance of a solid body, with all the effect of relief and distance, is now well known. It is generally known, also, that the two pictures to be combined must each represent the object at a different angle or point of view—that is, one must give the view which would be presented to the right eye, the left being closed; and the other must give the view which would be presented to the left eye, the right being closed. Without entering into the details of the theory of binocular vision,

* Sold by Henry Squire and Co., in bottles, at 1s. 6d., 3s., and 4s. 6d.

with which we presume the intelligent reader to be familiar, we at once proceed to the mode of producing the requisite pictures.

There are various modes of doing this. They can be produced on two separate plates, in two cameras placed at the proper angles, or by two operations by one camera, which is moved a few inches for the second picture. The best method is, however, to use a stereoscopic camera, with two lenses, of exactly similar foci, fitted into the camera two inches and half from each other. In this case the two pictures require transposing for the stereoscope.

Perhaps a better mode still of producing the pictures is by a stereoscopic camera with one lens. The camera is fixed on an adjustment of sliding parallel laths invented by Mr. Latimer Clark. The two pictures are taken on one long glass; the dark frame slides in a groove at the back of the camera, so as to bring alternately one half of the plate and then the other opposite the lens. The sliding laths have an adjusting screw to regulate the ratio of convergence, so that the camera shall move in the arc of a circle, of which the sitter is the centre. When properly adjusted, the sitter focussed, and in the centre of the ground glass when the camera is in one position, the image will still be sharp and in the centre when the camera is moved to the opposite position. A prepared plate in the dark frame is placed in the groove of the camera, with the lathes moved to the operator's right hand, the slide occupying the right-hand position in the groove. Having given the necessary amount of exposure, replace the cap on the lens, and slide the camera to the left hand, sliding the dark frame in the groove in the same direction. Again remove the cap and expose the second picture; the two pictures will be thus produced on one glass in the right position for the stereoscope.

COLOURING POSITIVES.

The colouring of photographs with dry colours is a subject that has received but very little attention ; it is, consequently, but little understood and imperfectly practised. In fact, it seems rarely to have occurred to the photographer that any knowledge of art, or of the effects of colours, was necessary in colouring photographs, and many confidently smear a portrait with colour, who would make but sorry sign-painters. Perhaps one important cause of the imperfect results so generally produced has been the imperfect material used for the purpose. A few coarsely-ground common colours have been sold for the purpose, and the directions for their use we have seen in more than one "Instruction Book" have been to the effect, that these colours are to be "dusted over the picture!"

Recently, however, Messrs. Newman, so long celebrated for the superior production of every requisite for the artist, have turned their attention to the preparation of dry colours for photographs, and the result is a choice selection of every possible tint, prepared with the greatest delicacy, and adhering to the plate by the simplest manipulation.

The colours are, as the reader knows, in the form of a powder, comminuted by careful grinding to the utmost possible fineness, and are generally prepared to adhere to the plate by the addition during grinding of some resinous gum. They are to be applied to the plate by means of a camel's-hair pencil, of proper quality, to be described anon.

It must be premised that, whilst the education of a professional artist is not required to enable the photographer to use these colours, yet without some knowledge of the value of colours, their influence on each other, and the effects of their combination and contrast, good results cannot be hoped for. A knowledge of drawing is not absolutely necessary, as the

perfect outline; as also the light and shade, are already furnished in the photograph; yet, if the colourist be ambitious to attempt backgrounds, some little knowledge of drawing will be found of great service. It is at least absolutely necessary that some taste and judgment be used, if the production of anything like *pictures* be desired.

Having procured an assortment of colours, obtain also a box containing a number of cells lined with paper, into which small portions of the various colours are to be transferred. If a box of Newman's colours be obtained (and it is best to have a complete box at once) the velvet pallet will always have a supply of colour from the bottle, available for convenient use.

The choice of pencils is of great importance, as, having to be used dry, unless they are of the best materials and manufacture, it is impossible to retain a point; the separate hairs of common brushes each asserting their individuality, and spreading every way, the result is, that the colour is literally "dusted over the picture." For general purposes, we prefer camel's hair as softer than sables. They must be so made as to carry a firm, well-supported point, so that, having been pointed, by briskly agitating in a tumbler of clean water, and then drawn through the lips, they do not when dry at once spread into the form of a dusting-brush. A few small sables will be found useful for fine lines and delicate spaces. A good stock, quite clean and ready-pointed, should always be kept at hand; and it is desirable to keep one pencil for each separate colour.

The glass positive may be either coloured on the collodion film, or it may be varnished previously. If the picture be perfect and of a fine tone, the blacks rich, clear, and transparent, it is better unvarnished, as varnish invariably lowers the whites more or less. In this case the finished picture must be carefully sealed from the action of the atmospheric air, and the various gases it often contains. If the blacks are dead and hard-looking, or have at all a rusty appearance, the

picture will be improved by varnishing, even at the sacrifice of a little loss to the whites. It is a point of some importance to have a suitable varnish for colouring on, as some excellent protective varnishes dry hard and glassy, so that it is difficult to make the colour adhere at all satisfactorily. The best varnish for use by a skilful and careful colourist is that* prepared for varnishing the alabastrine photographs, described on another page. The dry colours adhere to the surface of this varnish like crayons, so that in skilful hands very fine results may be obtained. In some cases the colour may be applied to the collodion film, after which the picture is to be varnished and then retouched with colour. As, however, it is easy to spoil a picture by this method, we do not recommend it, except in skilled hands.

The picture ready to receive the colour, a small portion is taken up on the point of a camel's-hair pencil, and applied to the picture with a light circular motion. It is as well, perhaps, to begin with the forehead, using No. 1 complexion colour; in some cases it will be necessary to add a little yellow. Commence on the highest lights and soften gently into the shadows, which should receive the slightest possible amount of colour, otherwise the roundness of the picture will be destroyed and the likeness injured. Very little colour should be laid on at one time; depth is to be obtained by repeated applications, the surface of the picture being breathed on, and then suffered to dry between each application of the colour, in order to secure better adherence. The outlines of each feature must be carefully traced, and caution used to avoid covering the shadows of the mouth, nostrils, &c., and to avoid touching the eyes with the flesh colour. Having obtained an even, delicate coating of the flesh tints, on the face, neck, hands, &c., the colour of the cheek is to be heightened, by the addition of a coating of complexion

* Sold by Henry Squire and Co., in bottles, at 1s. 6d., 3s., and 4s. 6d.

colour, No. 2 or 3, or carmine, as the subject may require. The lower lip is then to be coloured with^o the colour provided for the purpose, modified to suit the necessities of the case. The upper lip being in shadow, must be carefully touched, and in some cases not at all, as there is danger of making it appear coarse and swollen. Dark eyes, either hazel or grey, are best untouched, but to the iris of light grey or dark or light blue eyes, a little of the proper tint on the point of a fine sable may be applied, taking care to avoid touching the pupil. The hair must now be touched in the light and half-tones with the local colours, avoiding the deepest shadows.

If the draperies are to be coloured, now proceed on the same principle as in the flesh tints, beginning with the lights and softening into the shadows. Remember that, without great skill is used, it is best to leave the draperies alone, as richness of light and shadow, especially in fabrics of silk, and the delicate effect of texture in all fabrics, are so beautifully rendered in good photographs, and so difficult to preserve in any style of colouring. Unless, therefore, it be absolutely necessary, we recommend the novice to leave the bulk of the draperies uncoloured, touching merely the ribbons and such small matters as present but little light and shade to be destroyed.

If the background is to be coloured, considerable skill and practice is required to produce good results. Various shades of grey, green, brown, &c., may be used for the purpose, but the most favourite background for photographs is the sky and landscape; whichever be chosen, a large soft pencil is necessary to produce an even smooth surface of any extent, a smaller pencil being used to bring the colour up to the outline of the figure. The colours used for the background should never be too brilliant: the object should be to give relief to the figure, not to distract attention from it. A sky background, if judiciously managed, generally pleases, because

blue being a cold and retiring colour, it gives relief and boldness to the portrait. It is best, however, to avoid too large an extent of clear blue sky, but to have it broken with clouds of grey, brown, &c., which may be lighted up at the edges with a little white or yellow, or the two mixed. Towards the horizon the sky may be warmed with a little red and yellow, giving the effect of a glowing sunset. The point where the sky joins the landscape must be coloured in bluish grey or green, or with the colour labelled "distance," the advancing points and foreground with warmer greens, combined with yellows and browns. All sharp outlines should be avoided in a background, the figure only showing distinct and definite in all its details.

As the shadows of the landscape are obtained by leaving untouched the background of the plate, it should be of a tolerably dark grey to produce good effects.

After colouring the draperies and the background, again retouch the face, as it will appear considerably modified by the influence of the surrounding colour.

The superfluous colour is to be blown off from time to time by an elastic India rubber bottle, prepared for the purpose. Blowing with the mouth must be avoided, as there is danger of spotting the picture with moisture.

Jewelry is usually put in with gold moistened from the gold shell; great care is required to do it neatly, and avoid giving a vulgar bedizened effect to the picture. Flowers, also, may occasionally be skilfully touched in with water colours; but it must be remembered that too free a use of water colours destroys the harmony and impoverishes the appearance of the remainder of the picture.

When the picture is completely coloured, take a clean pencil, and carefully remove the colour which has accidentally touched the shadows, the edges of the dress, hair, &c., and then, as soon as may be, put the picture up into its case, to secure it from dust and injury.

Paper positives on albuminized paper may be coloured in the same way, but additional skill and care are required to produce good effects.

The colouring process requires time, patience, and care, as well as taste and skill ; and, unless the photographer is fully prepared to exercise these, he had better leave the photograph untouched, as it is better so than hastily daubed. The practice of smearing a little carmine, or other similar tint, on the cheek only, and then imagining the picture is coloured, cannot be too severely condemned.

HINTS ON DRESS.

It has formed no part of our intention in this manual to enter into any explanation of the theories on which the various processes in Photography are based, our limits confining us to the production of a strictly practical guide. It is necessary, however, in speaking of the influence of dress on portraiture, to make a few remarks on the photogenic action of colours.

We have hitherto spoken of the agency of *light* on the sensitive plate; it is not, however, to light—as popularly understood—that photogenic action is due. The properties of light, or of the solar ray, are of three kinds, and present the phenomena of colour and vision, of heat, and of chemical action. White light—when refracted, or divided into its constituent parts by means of a prism—gives what is termed the “solar spectrum,” showing that it is composed of seven colours, namely, violet, indigo, blue, green, yellow, orange, and red. These may be resolved into three primary colours—red, yellow, and blue; the others being formed by combinations of these. Red represents the *calorific*, or heat giving ray; yellow, the *luminous*, or light* giving ray; and

* Light is here used in its popular sense of an illuminating agency.

blue, the *actinic*, or chemical ray. Red and yellow exercise but little if any influence on the sensitive plate, the chemical action being due to the blue ray. Hence it will be seen that some of the most brilliant colours on the painter's pallet, as vermillion, chrome, yellow, Paul Veronese green, &c., would possess no more photogenic value than black. These remarks being borne in mind will prevent some disappointment to the novice, as to the results of different coloured draperies.

In addition to the influence of colour, a few remarks on texture may be of importance. Silks and satins, as falling into rich folds, and reflecting much light, give good results. Velvets and coarse woollen fabrics, if dark, on the contrary, absorb the light, and do not produce good effects. Fabrics of net-work, or tulle, for the same cause, produce similar results.

Dark dresses generally have the best effect in photographic portraits. For ladies dark silks and satins are generally preferable; for ladies, or children, of very fair complexion, however, lighter dresses are admissible, as the time of sitting may be shortened. Violent contrasts in dress should be avoided; for instance, a black velvet jacket and a light skirt, or a light complexion, is unpleasing in its results. Persons of very dark, or very sallow, or freckled complexions may wear dresses reflecting little light, as they will bear longer exposure than fair persons, but they should, on no account, wear very light dresses. Dresses of plaid, or similar patterns, have a very pretty effect in children's portraits. Lace should be as open in pattern as possible, and should be over a dark dress. White, or very light coloured muslins and cottons, are altogether ineffective, and should be avoided.

LANDSCAPES AND VIEWS.

For views of every kind, the single achromatic lens is preferable to the portrait combination, and is better (especially in bright weather), used with the diaphragm or stop. For a landscape with extended horizon, some care and judgment is required in focussing. The best effect will generally be obtained by giving the utmost sharpness to the first and second range of foreground, allowing the distance to appear with its natural indistinctness. The choice of position must rest entirely with the operator, who must bear in mind that on this part of his business it largely depends whether he shall produce merely a map or plan of the subject, or a *picture* worthy the approval of the connoisseur. In taking architectural or similar subjects, it is important, if possible, to choose a position at an elevation of at least one-third of the height of the building; this will enable the operator to obtain an image without inclining the camera. If this were done the vertical lines, instead of appearing quite perpendicular, would converge, giving the object a pyramidal form, or to make it appear as if falling. It is also important in taking views of buildings to allow a sufficient space for background on the plate, in order that the edifice may not appear cramped for room. Where it is practicable, the camera should be placed about double the entire dimensions of the building from it. This will, in most cases, give somewhat natural proportions to the picture.

As to the mode of proceeding as regards the use of a dark tent, &c., all this must largely depend on the extent to which the operator intends to carry his out-of-door proceedings, and we must leave the choice of the various accommodations for the purpose to be regulated by circumstances. . . .

DRY COLLODION PROCESS.

The difficulties attendant on packing and using in the field all the requisites for the practice of the collodion process, as we have described it for portraiture, render it almost useless for landscape purposes to a large class of amateurs. Some means of preserving the sensitiveness of collodion plates for the field, after preparing them at home, has always been a desideratum. Various methods of effecting this have been proposed, and tried with more or less of success. Amongst these have been the mode of preserving the moisture of the film by the use of neutral deliquescent salts, such as the nitrate of zinc and the nitrate of magnesia; and by the use of preservative syrups, such as honey, oxymel, &c. Any method, however, of preserving the sensitiveness of the plate by retaining its moisture must obviously yield in utility and convenience to a process by which the sensitive plate can be used quite *dry* and *hard*. Such a process we are about to lay before the reader. For the details of the manipulation, and permission to insert them here, we are indebted to the courtesy and kindness of Dr. HILL NORRIS, of Birmingham, a gentleman to whom the photographic world is largely indebted for his extensive researches in the collodion process, and as the *originator* of the collodio-gelatine dry process. Several modifications of it have been propounded as new processes; but as they are, for the most part, we believe, departures from simplicity to complexity; without equivalent advantage of any kind, they are unworthy of notice.

Plates prepared by the following process, are stated by the highest authorities to combine almost every advantage the travelling photographer can desire. They will keep indefinitely in any climate; either before or after exposure; they rival albumen pictures in sharpness; they may be used for taking the most dimly lighted places, as cathedrals, caverns, bottoms

of rivers, &c., not only because they are little inferior in sensitiveness to wet collodion, but because they may be exposed for an unlimited period if necessary; they may be developed by the usual means, and finally, being dry and hard, they can be packed closely together, occupying little space. With these remarks we proceed to describe the process:—

FIRST OPERATION.—To clean the plates, place them for a few hours in a strong solution of washing soda, and while in, rub the surfaces well with a plegget of rag. Wash well to free from the soda, and then dry and polish, as described for wet collodion.

SECOND OPERATION.—The coating with collodion and sensitizing in the nitrate bath is conducted precisely as in the ordinary wet process, and as the collodion* does not contain acetic naphtha, camphor, or any other foreign body, the usual negative silver bath may be employed without running the risk of spoiling for the wet process.

THIRD OPERATION.—For washing away all free nitrate of silver from the plate, provide three flat dishes of porcelain or gutta percha, and fill with pure distilled water (not common or rain water). Take the plate from the bath and permit it to drain for two minutes, and then immerse in the first dish of distilled water. Proceed now to prepare a second plate in the nitrate bath, and when this is ready, transfer the former plate to the second dish of distilled water, and so on till the first plate has passed into the third dish. The first water must not be used more than three times, when its dish must be washed out and refilled, and placed for the third or last swilling. When the plate is removed frogn the first water, it should be slightly washed, back and front, with distilled water, kept in a jug for the purpose, so that as little nitrate

* Dr. Hill Norris's dry negative collodion, which is best adapted to the dry process, and is the result of long research by the inventor into the conditions required. It improves by keeping. 12s. 6d. per lb. of 20 fluid ounces. Sold by Henry Squire and Co.

of silver as possible may be conveyed into the second water. While the plates are soaking, a rocking motion should be given to the dishes occasionally. The plate having remained for about five minutes in the third water, should now be taken out, and the surface slightly swilled. It is now, after draining about a minute, ready for the

FOURTH OPERATION.—COATING WITH GELATINE.—The gelatine solution* is prepared as follows:—

Transparent gelatine	100 grains.
Distilled water	20 oz.

Dissolve and keep warm till clear by subsidence; then add two ounces of alcohol. When about to be used it must be made very hot (no fear need be entertained of blackening from this cause). The gelatine solution may be readily heated by placing a bottle of it in a saucepan of boiling water. The capacity of the bottle must depend upon the size of the plates in preparation. It must be understood that the gelatine is not heated simply to liquify it, but because it penetrates better into the pores of the plate, and the plate being heated, dries more readily and evenly. Now take up the slightly drained plate, and pour on one end sufficient of the hot gelatine solution to cover the whole surface, and impart to the glass a degree of warmth, float backwards and forwards for two or three minutes, and pour off by the opposite end into the waste pan; reverse the plate and repeat this operation, with the exception that the solution this time may be saved for the first application to the next plate. The plate is now ready for the last operation, viz. that of drying. This may be done either spontaneously or by artificial heat; in either case the plate must be reared up, face outwards, on one corner, in a very clean place. If pre-

* Purified solution of gelatine, of the proper strength, brilliant and clear as crystal, which will not decompose. 2s. per pint, 3s. 6d. per quart. Sold by Henry Squire and Co.

pared at night, they may readily be dried by an ordinary brisk fire, at the distance of about two feet. When dry, they should be securely packed, and will keep indefinitely.

EXPOSURE IN CAMERA.—From 50 to 150 seconds in bright sunlight will generally be found sufficient, although some objects will require as much as four or five minutes under the same conditions, viz.—with a stereoscopic lens, of 6-inches focus, and $\frac{1}{4}$ -inch aperture; with a large lens, 21-inches focus, inch aperture, in good light; from $1\frac{1}{2}$ to 2 minutes; with $\frac{3}{8}$ -aperture, from 8 to 20 minutes.

DEVELOPMENT OF THE LATENT IMAGE.—Wet the plate by immersion in a flat dish of distilled water (common or rain water will not do), drain for one minute, and then pour over a sufficient quantity of the following developing solution :

Pyrogallic acid	3 grains
Distilled water	2 ounces
Glacial acetic acid	1 drachm

having previously mixed with each drachm required three drops of a 40-grain solution of nitrate of silver. If this mixture should go muddy, it must be thrown away, and the measure well cleaned with cyanide of potassium solution. For stereoscopic plates about two drachms of pyrogallic solution will suffice, and to this quantity six drops of nitrate of silver solution must be added. This mixture should be poured on to the plate at the end farthest from the body, off again at the other end; and again poured on opposite part to the first. The plate must not be put on a levelling stand, but kept in constant motion, and, if any inequality is observed in the development, let the solution be transferred to the measure, and poured on repeatedly at that particular point till the development is equalised. When the action of this first dose appears exhausted, apply a second quantity, containing six drops of silver solution to the drachm. This will rapidly intensify and complete the development. Now wash and fix with cyanide of potassium, five or six grains to the

ounce of water, or with strong solution of hyposulphite of soda. When the fixing solution has removed the greater body of the yellow iodide, swill off, and apply again only to those parts where it still remains, as a prolonged action of this agent weakens the negative too much. The plate may now be dried, and varnished with the ordinary French varnish. If time is not an object, very beautiful results may be obtained by developing with a saturated solution of gallic acid to every ounce of which ten drops of the nitrate of silver solution have been added. This must be conducted in a flat dish, as the development may occupy an hour or more.

We believe the above is the best *dry process* which has been made public. But, for all who would secure success without the risk and trouble involved in preparing plates themselves, we recommend the plates of the "Patent Dry Collodion Company," which are prepared by Dr. Norris's most improved and recently patented process. We believe that to most persons the purchase of plates ready for the camera, by which they may be certain of good results, if reasonable care be used, will be the *cheapest* as well as the safest course.*

* These plates may be had of Messrs. Henry Squire and Co., at the prices of the company, as follows:—

	PER DOZ.
	£ s. d.
4½ by 3½	. 0 5 0
5½ " 3½	. 0 5 10
5 " 4	. 0 6 8
6½ " 3	. 0 6 6
6 " 4	. 0 8 0
6½ " 3½	. 0 8 9
8 " 6	. 0 14 0
8½ " 6½	. 0 18 0
9 " 7	. 1 1 0
10 " 8	. 1 6 8
11 " 7	. 1 5 0
11 " 9	. 1 13 8
12 " 9½	. 1 18 0
12 " 10	. 2 0 0

Larger sizes, up to 32 by 26, to order. The plates are securely packed in cases impervious to light or moisture, and each packet contains full and lucid directions for exposing, developing, &c.

TRANSPARENCIES FOR THE STEREOSCOPE.

These may be printed on dry collodion plates by superposition. The prepared plate should be placed, face uppermost, upon a piece of board or a frame covered with black cloth, the negative should then be placed upon it, both the glasses being kept quite flat. This, of course, should be done in the dark. Instantaneous exposure to diffused daylight will generally be sufficient, or for a few seconds to the light of gas or a lamp. Develop and fix in the usual manner. Bleaching the picture so produced by means of bi-chloride of mercury, and blacking by dilute-ammonia, as described in page 23, improves the tone. By the use of dry plates for printing transparencies, all danger to the negative is avoided, besides securing greater sharpness than can be obtained where wet collodion is used for the purpose.

COPYING.

Engravings or paintings to be copied must have the glass removed, to avoid the irregular reflection it causes. Daguerreotypes, for this reason, are somewhat difficult to copy, as also are varnished oil paintings. Care must be used to place them in such a position as to avoid the reflection as much as possible; the camera and object to be copied must be placed quite parallel to each other; the sliding body of the camera extended sufficiently to give the copy the size desired. If the copy be required the size of the original, the distance between the focussing glass and the lens should be just the same as the distance between the lens and the object to be copied. If an enlarged copy be required, the focussing glass must be removed still further in proportion to amount of enlargement to be obtained. For this a copying camera, admitting of the necessary extension, will be required.

The collodion for copying purposes is generally best somewhat old, and thick, the requisite intensity being thus more easily obtained. The time of exposure will vary with the nature of the subject and the size that is to be copied; but in most cases, except where the subjects are light prints or engravings, the time will be much longer than for portraits from life, at least double the time being often required.

IMPERFECTIONS AND FAILURES.

It will rarely happen that the novice meets with uninterrupted success in his photographic career; we therefore conclude the "PHOTOGRAPHIC TEACHER" with a chapter on imperfections and failures, their causes, and how to remedy them.

Imperfections in either glass negatives or positives generally proceed from fogging, stains, spots, or want of definition and sharpness.

Fogging, so called from the picture appearing obscured as by a veil or mist, may arise from a variety of causes. It may proceed from alkalinity of the exciting bath. If this be ascertained to be the case by testing with reddened litmus paper, add to the negative bath glacial acetic acid until a slightly acid reaction is induced; to a positive bath a drop or two of nitric acid may be used until the same result follows. If the bath is in proper order, fogging may proceed from diffused white light having obtained admission into the dark room, or into the camera. Direct sunlight striking the lens will also produce a similar result. Over-exposure of the picture, or over-development, will at times produce a somewhat fogged appearance; the developing solution used too strong, or

with too little acid, has a similar effect. Ammoniacal or other vapours in the operating or dark room have a similar tendency. If it proceed from none of these causes, it is probable that some impure substance has obtained admission into the bath, which, in that case, should be discarded.

Stains proceed from dirty plates; from lifting the plate out of the bath too soon; from making a pause during the first immersion; or from reversing the plate after lifting it from the bath. Also, from not covering the plate all at once with the developing solution; from the developing solution not having sufficient alcohol, and so running on the plate in greasy-looking lines; from pouring the developing solution too forcibly on one spot; from using dirty dark frames: these should be wiped each time with a piece of cloth; from holding the plate with fingers which have been in recent contact with cyanide of potassium or hyposulphite of soda; or from using the cyanide of potassium so strong as to attack the picture. Crape-like lines or fringes may either arise from inferior collodion, the collodion being used too thick, or from immersing the plate before the film has properly set. Stains and discolourations will also arise from imperfect washing after the plate has left the fixing bath.

Spots arise from a variety of causes, but the most fertile is the presence of dust in the operating-room. To obviate this, it is of the utmost importance that dust be excluded as much as possible. The floor should not be carpeted, either the uncovered boards or oilcloth are best, as both these can be frequently washed. Every part of the room where dust collects should be dusted every evening, not in the morning, in order that particles of dust may not be floating in the atmosphere. A stock of glass plates should always be cleaned in the evening, in order that the particles of flue from the linen cloths may not be flying about. The plate should be carefully wiped or blown the last thing before coating, to ensure freedom from dust on the plate. Spots may also arise from

the sediment at the bottom of the collodion being disturbed. If the collodion be rendered sensitive by iodide of potassium, it will sometimes happen that undissolved particles will remain in suspension, and cause spots, especially when anhydrous ether and alcohol are employed. In this case, the addition of a drop of distilled water will sometimes remedy the defect. Spots are sometimes caused from turbidity of the nitrate solution; filtering is then necessary. Rough and imperfect glasses will also cause spots on the picture.

Want of sharpness may be caused in several ways. The first and most obvious is imperfect focussing, or the sitter having moved his position after the focus was obtained; unsteadiness of the camera or stand, or of the sitter during the time of sitting. If from none of these causes, it may arise from the optical and chemical foci of the lens not being exactly coincident; or from the plate and the focussing glass not occupying exactly the same position in the camera, or from the plate not resting evenly in its place in the frame.

The results of over or under exposure and development have been described in the instructions for the respective processes.

IMPERFECTIONS IN PAPER POSITIVES.

If these arise from corresponding imperfections in the negative, it will be easily ascertained. If from faults in the paper or manipulation, they may be as follows:—

Spots may arise from metallic particles in the paper; if quite on the surface, it may be from some impurity floating on the surface of the nitrate of silver. Stains also will arise from too much fingering of the paper in any part of the manipulation.

A *marbled appearance* in the print will often arise from an insufficient supply of nitrate solution in the dish for sensitizing, or from an inferior quality of paper, which imbibes the solution unequally.

Bronzing and loss of details in the shadows arise from a somewhat under-exposed and over-developed negative. A paper prepared with less salt is best for such a negative.

Markings of the brush. This may occur in paper prepared by the ammonia-nitrate process, and arises from excess of ammonia. To remedy it, add a little fresh nitrate of silver.

The print has a faded, feeble appearance. This most frequently arises from the nitrate solution being weak, as it loses strength by repeated floatings.

Yellowness of the whites. This is most common in albumenized paper. It may arise from an old toning "bath" being used, which requires a long time to give the right colour to the shadows; or from the print being exposed to the light during the process of washing and toning; or from the paper having been too long sensitized.

The print tones slowly and imperfectly. Add a little more chloride of gold to the toning bath, and, at the same time, a few crystals of hyposulphite of soda. When a toning-bath gets very old and decomposed, it is best thrown aside altogether, as the toning and fixing are too important to allow anything in use which is doubtful.

In all cases of difficulty, and where imperfections arise from unknown causes, proceed systematically in efforts to remove them, first examining the most obvious causes, and when well assured that the defect is not there, proceed to sources of error more remote. It is wise to have duplicate stocks of many things, such as two nitrate baths, two bottles of developing solution, of collodion, &c. This will aid in ascertaining what is in fault, and also prevent the operator being brought to a dead stop on any occasion. Once more we repeat, do not be seduced under the plea of cheapness to use imperfect articles of any kind in photography.

We conclude by once more enforcing the importance of cleanliness at every stage, always keeping each cloth, bottle, bath, dish, and funnel to its own specific use; and keeping

the fingers, when smeared with one solution, carefully from contact with any other. Never be satisfied with mediocrity, but act under the assurance that, with careful operating and the best materials, you have here the best processes, and ought to produce the best results.

APPENDIX.

TRANSFERRING THE COLLODION FILM FROM GLASS TO LEATHER, &c.

THE mode of transferring the collodion film from glass to various other substances, as given in a former edition, was somewhat complicated and troublesome. Amongst many methods which have recently been recommended, "we think the following possesses the merit of extreme simplicity, and we have tried it with perfect success.

A collodion of tolerably strong body and yielding a tough film is best for producing pictures for transfer. The removal of powdery films is always attended with risk, not only on account of their want of tenuity, but because they adhere more firmly to the glass. The picture having been dried, a mixture of alcohol and nitric acid—about ten minims of the latter to an ounce of the former—is to be poured on the surface and off again once or twice. A piece of black, glazed paper, oil cloth, or patent leather, a trifle larger than the plate, is to be treated the same way until no signs of a greasy surface remain. The picture, face downwards, is now, whilst both surfaces are wet, to be placed upon the black, glazed surface, and pressed carefully upon it, taking care to avoid air bubbles. The two are now to be kept in contact by placing in a pressure frame for half an hour or an hour, until quite dry, when they may be separated. The collodion film will leave the glass and adhere to the surface of the leather or cloth with the greatest tenacity. The chief danger to be avoided is the

formation of air bubbles* between the film and the black glazed surface, which would inevitably mar the beauty of the picture, and often cause the film to tear where they occur.

M I C A.

For lockets, brooches, rings, &c., the use of mica is desirable, as being easy in manipulation, and free from the risk attendant on cutting glass, or transferring the film. Mica, as many of our readers may be aware, is a transparent mineral, which may be divided into sheets scarcely thicker than tissue paper, which are clear and transparent as glass, and at the same time may be cut with scissors as easily as paper. It presents much the appearance of a thin sheet of gelatine, but is more transparent. The difficulty of procuring it readily, perfectly free from flaws, cracks or striæ, has, we apprehend, caused it to be, hitherto, comparatively little used among photographers.* Unlike the enamelled iron tablets, it will not injure the bath, and being so extremely thin may be used in the shallow boxes of rings with the greatest ease. The mode of manipulating is extremely simple. A piece of mica, free from flaws, a little larger than the locket, &c., required, is moistened on one side with the tongue or otherwise, and placed on the centre of a plate of glass a little larger—the $3\frac{1}{4}$ by $2\frac{3}{4}$ plate is a convenient size. Breathe upon the surface to see if it be clean; a little gentle rubbing with a soft wash leather is generally all the cleaning necessary. The collodion is now poured on as usual, and, flowing over the edges on to the glass plate, the mica is firmly held there. The remainder

* It may now be had in packets of fifty perfect plates, at 2s., 3s. 6d., and 7s. 6d., of Henry Squire & Co.

of the manipulation is as usual, until the picture is finished, coloured, and varnished. A penknife then passed around the edges of the mica separates it from the glass. It may then be backed either with black varnish, velvet, &c. It is cut to the required shape and size with scissors, a little care being required to avoid causing crack-like flaws running into the picture. Portraits on mica are extremely eligible for transmission through the post.

NEGATIVES BY POSITIVE PROCESS.

A method of producing instantaneous negatives, or at least by a shorter exposure in the camera than is necessary in the ordinary negative process, has long been desired by photographers, and has recently received much attention. The fact that in a dull winter light it is almost impossible to produce a negative by means of a pyrogallic acid developer, and that, even in a good light, in extremely cold weather, it is almost equally difficult, renders it a matter of importance, to the professional photographer especially, to possess some method of surmounting the difficulty.

Various plans have been tried, with more or less success. That most simple and reliable appears to be based upon the principle of what is called accumulation of development. A positive is taken and developed with proto-sulphate of iron—almost any formula which gives a picture perfect in all its details will do—and then further developed with a solution of pyrogallic acid and nitrate of silver.

To ensure the best results proceed as follows.—Use a collodion favourable to the production of density in the image, and excite in a bath as nearly neutral as is consistent with

the production of clean pictures. Expose about the time necessary for a positive, or a trifle longer, then develop with the following :—

Proto-sulphate of iron	5 grains.
Acetic acid (glacial)	5 minimis.
Distilled water	1 oz.

The acid should be added immediately before use. Under favourable conditions, excellent negatives, abounding in half-tone, and with sufficient density in the lights, may be obtained with this developer, which is recommended by Mr. Sutton in preference to any other, without further treatment.

Another formula for negative development, recommended by Mr. Hardwich as superior to pyrogallic acid, in a dull light, or cold weather, is a solution of the acetate of iron, prepared as follows :—

Sulphate of iron	12 grains.
Acetate of lead	12 grains.
Beaufoy's acetic acid	1½ drachms.
Water	1 oz.

The acetate of lead and acetic acid are to be dissolved in half the water, and the sulphate of iron in the other; the two solutions are then to be mixed, when a solution of acetate of iron and a precipitate of sulphate of lead will result; the latter must be got rid of by filtration. This solution will keep good some time, and will produce excellent results. Instead of acetate of lead, acetate of soda may be used in the above formula, using only six instead of twelve grains to the ounce. In this case the sulphate of soda formed remains in solution; there is, therefore, no deposit to render filtration necessary.

By either of the above developments it is possible to obtain a negative with less than half the exposure in the camera usual for development with pyrogallic acid. But it will

sometimes happen that the negative is wanting in intensity, in which case the accumulative developing process should be applied. By this means from even a faint positive, if perfect in detail, a very good negative may be obtained. After fixing—hyposulphite of soda is better in this case than cyanide of potassium—the picture is to be thoroughly washed, and then treated with the ordinary pyrogallic developing solution, to which a portion of nitrate of silver solution has been added. The effect will be that fresh silver will be precipitated on the surface in all parts where a deposit of silver already exists. When this has ceased to act the plate may be again washed, and again treated in a similar manner. An accession of intensity is gained by each application, and any amount of density may be obtained.

VIGNETTE PHOTOGRAPHS.

Photographs under this name, in which the figure gradually merges into the background, and in which the background may graduate into almost any tint towards the margin, often possess a very fine effect. In paper positives this effect is generally produced during the process of printing in the pressure frame, and may be obtained either by means of vignette glasses sold for the purpose,* or a piece of card

* The use of the vignette glass saves time, and enables the printing to be conducted by diffused daylight. Sunshine is required for the use of a card. The vignette glasses may be had at the following prices :—

PORTRAIT VIGNETTES.

Inches.	Each.	Inches.	Each.
2½ × 2	.. 2 0	5 × 4	.. 3 0
2½ × 2½	.. 2 6	6½ × 4½	.. 3 0
4½ × 3½	.. 2 9	8½ × 6½	.. 3 6

LANDSCAPE VIGNETTES.

Inches.	Each.	Inches.	Each.
9 × 7	.. 4 0	14 × 10	.. 7 0
10 × 8	.. 5 0	18 × 12	.. 10 0
12 × 10	.. 6 0		

with an aperture of the desired size. The card of a broken oval passepartout answers very well. This is to be laid outside the glass of the pressure frame, and kept sufficiently in motion during the time of printing to prevent a hard, abrupt line being formed. A little practice, guided by skill and judgment, will be required to get the best results.

To produce vignette positives on glass, other treatment is required. One method is the use of a vignette glass of a reverse character to that used for paper prints: it must be opaque in the centre, and gradually become transparent at the edges. When the plate has been exposed properly in the camera it is to be taken into the dark room, the back of the slide opened, the vignette mask placed upon it, and then exposed for a few moments to diffused daylight, which produces a white edge graduating into the grey of the background and into the lower part of the figure.

Perhaps a better method than this is to provide a piece of cardboard, say fifteen inches square; in this cut an oval aperture, about the size of a half-plate oval, with a serrated edges the points half an inch or an inch long, radiating towards the centre. This on one side may be a dark grey, on the other white. Place this exactly opposite the aperture of the lens, from six to twelve inches from it, the distance regulating its effect on the plate. If a background graduating from the centre into a white margin be desired, place the white side of the card next the lens; if graduating to a dark margin, the opposite side of the card must be used. In either case, a light grey screen for the background will produce the best results. If a little advancing and retreating motion can be given to the card a softer effect is produced.

CHROMO-PHOTOGRAPHS.

This name, which rightly applied would suggest pictures actually produced in colours by direct photographic action, has been, somewhat inappropriately, given to a process of colouring glass positives, by which some very beautiful results may be produced, and by which the coloured picture is seen non-inverted, and presents, therefore, the accurate position as to right and left, of the sitter. Of the method used by the gentleman who has adopted the above name for his productions, we know nothing, but very perfect results may be obtained by the following treatment, which we extract, by permission, from an excellent work on colouring photographs just published by Newman, of Soho Square :—

“ The mode of producing this result is simple, and when well done presents somewhat the effect of enamelling on glass. It depends, in the first instance, however, on the collodion film being permeable. This is sometimes the case in ordinary positives taken with a collodion, the pyroxyline of which has been made at a high temperature, and thus giving a powdery film. This permeable film, however, is much best obtained by the ‘ alabastrine process,’ and the best specimens we have seen of the non-inverted coloured positives have been produced by it. The picture having been varnished and coloured, and, if necessary, varnished and coloured again, a little extra care being used to obtain brilliancy in the carnations, is to be varnished once more with a penetrating varnish provided for the purpose, which has the effect of projecting the colour thoroughly *into* the collodion film ; the result is, that the positive then viewed from the glass side presents a picture as vividly coloured as on the collodion side. The effect may be still further improved by going over the face again with No. 1 flesh colour. It is important that these pictures should be

taken on *colourless* glass, the ordinary green glass materially injuring the tone of the picture. It must be remembered, also, that the penetrating varnish materially affects the tint of many of the colours. This modification of tint must be allowed for in applying the colours, experience dictating the extent of the modification to be expected."* The picture should be backed with velvet of dark maroon or violet tint.

CLEANING PLATES.

An excellent method of cleaning plates, by which much of the trouble attendant on the usual plan is avoided, is the use of residues of collodion—a few drops poured upon the plate and applied all over the surface with a piece of cotton wool, the plate is then polished with a cloth or wash leather. As this is an expensive plan where waste residues are not in hand, the use of "The Photographer's Detergent"† will be found a quick, cheap, and effective method of securing the desired end. The bottle is to be shaken, and a few drops of the "detergent" applied to the plate, which is then to be rubbed briskly on both sides with a piece of woollen rag ; this is then rubbed off with one cloth and polished with another, and a perfectly chemically clean plate is obtained in a few seconds, without the use of water. When the "detergent" becomes too thick, dilute with alcohol. A shilling bottle will clean an almost infinite number of plates.

* Practical instructions in this or any of the processes in this book may be had of the author, 34, Upper-street, Islington.

† In bottles at 8*s.* and 1*s.* Henry Squire and Co.

TRANSPARENT ENAMEL PHOTOGRAPHS.

These are unquestionably amongst the finest productions of the art, taking rank with paper proofs in all points that constitute the special advantages of paper, such as facility of reproduction by printing from negatives, depth, vigour, &c. ; whilst in delicacy of detail, purity of tone, susceptibility of receiving high finish from the pencil of the artist, and permanence, they immeasurably surpass the finest proofs on paper.

Thus much as regards their character as positive prints, but they possess another excellence peculiarly their own, they are positives when viewed by transmitted as well as reflected light; and in this respect, as transparencies, they far surpass any other photographic transparencies we have met with, whilst we see no reason why their production should not be just as easy both as regards cost and trouble.

The invention is due to Mr. Glover, who has protected his right in the matter by means of a patent. The substance on which the pictures are taken is glass, flushed with a pure white enamel. The surface of this is slightly granulated by means of a preparation of hydrofluoric acid. The plate in this condition is then ready for further treatment by means of the collodio-albumen, the collodio-gelatine, or the ordinary wet collodion process. By any of the dry processes the printing from the negative can be effected by super-position, as described in a former chapter on "Printing Transparencies." If the wet collodion process be adopted, printing by super-position is troublesome and inefficient, it being necessary then to interpose thin pieces of card at the edges to prevent contact between the negative and wet plate. This plan, whilst it is troublesome in itself and dangerous to the

negative, also precludes the possibility of obtaining perfect sharpness. In using wet collodion, therefore, for this process, we recommend camera printing as the most simple and efficient method. The mode is as follows:—

Procure a box with an extending body, darkened inside, made, indeed, on the same principle as the camera, a groove at one end to receive the negative, and an aperture at the other to receive the exterior tube of the lens attached to an ordinary camera.* If the negative be now turned to the light, and the extending body of the camera, and that of the dark box, be properly adjusted, an image of the negative will be thrown on the focussing glass. The size, of course, will be regulated by the distance between the negative and the lens. If the printed copy be desired the same size as the negative, the latter will be placed the same distance in front of the lens as the ground glass is at the back. If a reduced copy be required, the extending body of the dark box in front will be drawn out to the requisite distance. A perfect focus being thus obtained, the working is just the same as with the ordinary collodion process.

A pyro-gallic acid developer, about two grains to the ounce, with very little acetic acid, has answered best in the hands of the Patentee, but this, we apprehend, is a matter of detail which each operator will decide for himself. As will be seen, the lights of the picture are the pure white of the enamel, which has been protected from the action of the light by dense parts of the negative. The blacks are produced by the reduced salts of silver, as acted on through the transparent parts of the negative. Of course this is obvious to the practised photographer, but we explain it for the benefit of the

* An extending dark box, with frames for receiving negatives of various sizes, from half-plate downwards, affording every facility for camera printing, as here described, is manufactured by Henry Squire & Co., at 15s. 6d. each.

tyro, and to show the necessity for the next process—toning. After fixing—hyposulphite of soda is better than cyanide of potassium in this case—wash thoroughly, and proceed to tone the picture. This may be done by means of a solution of sulphide of potassium, or sulphide of ammonia, a few drops to the ounce of water; the plate is covered with this solution, which rapidly changes the shadows to a rich dark brown; then wash thoroughly and dry. The best method of toning, and that recommended by the inventor, is to submit the plate, after fixing and washing, to a bath made as follows:—

Hyposulphite of Soda	4 oz.
Chloride of Gold	15 gr.
Distilled water	16 oz.

The hyposulphite of soda should be dissolved in 12 ounces of the water, and the gold in the remaining four; the latter poured gently into the former, agitating it at the time. The time for remaining in this bath will be from a few minutes to half-an-hour; when the shadows have assumed a fine purple black, it is sufficiently toned, and should be well washed and dried. It is then ready for any mode of colouring and finishing, or may be varnished* and left as it is.

As regards colouring, the tone and texture of the surface so nearly resembles ivory, that when skilfully coloured in water colours, the finished picture is scarcely distinguishable from an ivory miniature. Very fine results may be produced by a good colourist by the use of dry colours, whilst the surface is not less suitable for the operations of the oil painter. We have seen some very good results produced by colouring these pictures with transparent water colours, which have a fine effect in the stereoscopic transparencies, and suggest the

* A very clear, transparent, and hard varnish, suitable for the purpose, is sold by Henry Squire & Co.

possibility of effecting a very cheap and efficient substitute for stained glass windows.

Our own experiments in connexion with the process have been extremely limited, the subject having only been brought under our notice as the Second Edition was preparing for the press. As we understand, however, that full instructions, together with licenses to practise, prepared plates, and material, may be had of Messrs. Squire and Co., the sole agents of the Patentee, it is unnecessary to enter more fully into the details here.

STEREOSCOPIC CAMERAS.

New contrivances to aid the photographic tourist are announced continually; and as for the varieties of Stereoscopic Cameras their name is legion. Perhaps none have, however, come so near the minimum of lightness, height, and size, and possess at the same time such completeness and convenience, as one recently introduced by Messrs. SQUIRE & Co., under the name of the "POCKET STEREOSCOPIC CAMERA." In describing it, we cannot do better than quote the Editor of the "Photographic News," who says:—"This camera at first sight appears like a toy. We cannot persuade ourselves that the tiny apparatus before us is capable of being used in the serious business of photography, measuring as it does only two inches in depth, eight inches in length, by four and three quarters in width; it is only on erecting the sides, and placing the front board in its place, that we are convinced that we have a camera capable of taking stereoscopic pictures of the ordinary size, and possessing every quality ordinarily found in such cameras. It carries only a single lens, and is so constructed

that pictures may be taken at an angle of 6 inches, which is the maximum, and, of course, at any angle within that limit. The arrangement for altering the angle is of the simplest description, and yet at the same time the most perfect imaginable; a mere touch of the finger sufficing to move the camera to the desired position with unerring accuracy ; in fact, it is a perfect gem of its kind.

As regards its portability, our readers may judge of that from the dimensions we have given above, especially when we add that, including the focussing glass and dark slide, the entire apparatus weighs but 19 ounces, and can be dropped into a coat pocket with perfect ease.

Another arrangement of the same camera packs into a small box with several dark slides, &c.

Another Stereoscopic Camera, introduced by the same firm, is scarcely inferior in portability, and possesses some advantages peculiarly its own. It is intended for two lenses, but these, instead of projecting from the camera in the usual way, are contained *inside the camera*, whilst, instead of caps for the lenses, they are closed by an ingenious instantaneous movement both at once by a single touch. For instantaneous pictures this camera will be invaluable.

THE DIAPHANOTYPE PROCESS.

This name has been given to a mode of finishing the coloured paper picture, and has no reference to the mode in which the photograph is produced. The result, in the specimens we have seen, is most exquisite ; a richness and delicacy of colour, a softness and depth being attained, altogether unlike anything we have yet seen in coloured photographs.

The resemblance to Ivory Miniatures has become a phrase so hackneyed in speaking of coloured photographs, that it has ceased to possess much weight, or convey much idea. It is, however, the right comparison to use here; the resemblance in these pictures to ivory miniatures being so exact, that even a practised eye might easily be deceived. This will easily be understood when we explain, that the especial object of the process is to impart to the paper of the photograph one of the peculiarities of ivory, on which the extreme delicacy and softness of the pictures painted on it are famed. Ivory, it is well known, is semitransparent, or diaphanous in texture, and it is to this quality that much of the transparency, depth, and richness of the finished picture is due. In the process of which we are speaking, the photograph being taken on a piece of paper even in texture and free from specks, either plain or albumenized will answer the purpose, is coloured in water colours, comparatively little, and even inferior work being, we understand, required; it is then treated with the preparation, which, removing the comparatively opaque and dead texture of the paper, renders it diaphanous and clear. It is then backed with a piece of paper of a cream tint, and the effect is marvellous; the common-looking ill-coloured photograph is converted into a picture rich, soft, and delicate, apparently possessing all the finish of a first-class painting.

In order to be able to treat the coloured picture with the preparation it must not be mounted on cardboard in the usual way; but on a suitable strainer or stretching frame like canvas, into the back of which a loose piece of board is fitted to give firmness whilst colouring.

The process is we understand patented by Mr. Sarony, licenses with detailed instructions, material, &c., being supplied by H. SQUIRE & Co.

THE SOLAR CAMERA FOR OBTAINING LIFE SIZE PORTRAITS.

Everybody must at once recognise the value that would attach to perfect life-size portraits produced by photography ; and almost every photographer is familiar with the process of enlarging, to an almost unlimited extent, from a small negative ; but the difficulties which have hitherto attended the process for such enlargement, and the comparatively imperfect result obtained—the want of sharpness and depth, ~~rendering~~ rendering the “ touching ” of the artist invariably necessary, little has hitherto been done in that direction. We can now, however, introduce to the attention of our readers the invention of an American artist, which, by the perfectness of its results and the simplicity of its application, is likely to give an impetus to the production of enlarged pictures, and open out a comparatively new and unworked branch of photography.

As it will doubtless be interesting to the readers of the “ Teacher ” to know something of the construction of this instrument, we subjoin a description, chiefly condensed from an article on the subject by Mr. Sutton, of Jersey. There are two sizes of the camera, and it is the larger one we are describing. The box is seventeen inches long, and fourteen inches square. One end is open, and at the other end a portrait lens three inches aperture by six in focal length is fitted in the usual way. At the open end of the camera is fitted a strong brass back, to which is secured on the outside a long mirror two feet three inches by nine inches. In the inside is a plano-convex lens, nine inches diameter and seventeen in focus, to serve as a condenser. The mirror is so arranged, that it will work round an axis to follow the position of the sun. Between the condenser and the portrait

lens is a sliding box, in which the negative to be copied is inserted.

For use the camera is placed upon the sill of an open window, facing the sun, and firmly secured. A south window, where it is available, will give the greatest number of working hours in the day. The window must be thoroughly darkened, either by curtains or a shutter fitted for the purpose, as no light must enter the room, except through the negative to be copied. The mirror is then to be adjusted, so as to reflect the sunlight upon the condenser through it on the negative, the image from which is then thrown with great brilliance upon a screen at the opposite side of the room upon which it is focussed. A sheet of sensitized paper is then placed upon the screen to receive the image. The time required for printing will vary from half an hour to two hours, depending upon the strength of the light and the density of the negative. The picture may then be toned, fixed, and washed in the usual way.

We have remarked that the time of printing will be modified by the density of the negative; but it is a valuable peculiarity of this printing process, that a negative in the ordinary sense of the word is not required. An ordinary positive is sufficiently dense for the purpose, and prints quicker; whilst it gives in the print all the purity of whites, and depth of shadows, of the finest negative printed by super-position. The operator can stand in the room beside the print, watching and regulating its progress, shading parts that may require it, and producing thus a variety of background effects. The mirror is re-adjusted from time to time to the position of the sun by means of a screw inside the room.

The mode of printing adopted by Mr. Woodward, the inventor of the Solar Camera, is very simple. For the largest sizes he uses Hollingsworth's double-elephant drawing paper, and Saxony paper for smaller sizes. A large

brush is made by tying a piece of perfectly clean flannel on to a wooden handle, and with this the salting solution is applied to the paper, which, when dry, is sensitized with ammonia-nitrate of silver in the same manner.* When printed it is toned and fixed by the usual processes. The large baths for the solutions required are made of wood, lined with paper, and rendered waterproof, by varnishing with a solution of gutta percha in chloroform.

Another excellent point, Mr. Sutton remarks, of the Solar Camera is, the freedom from distortion in the image produced by it. We are not prepared to say that the image is mathematically perfect; but the distortion there, if any, is so trifling, that it escapes detection. Mr. Woodward asserts that the image is mathematically true, and justifies his assertion, by stating an experiment in which this point was tested. A piece of paper was prepared with geometrical squares crossed by diagonal lines. A collodion positive was taken of this, and projected, magnified eighty times, on a screen covering one hundred square feet. The image was found on accurate measurement to be geometrically correct, the lines, &c., being all free from curvature to the edge.

There are two sizes of the camera, the price of the smaller of which is, we believe, thirteen pounds, and of the larger, twenty guineas. Messrs. Squire & Co. are appointed agents for London.

* The mode of applying the ammonia-nitrate solution, described in a former part of the "Teacher," appears to us much preferable and simpler.

